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ABSTRACT

A cost benefit technique consisting of the following five phases is proposed: (a) specific objectives of the service, (b) measurement of work flow, (c) work costing, (d) charge to users of the information service, and (e) equating demand and cost. In this approach, objectives are best stated by someone not routinely concerned with the individual activities in a particular environment; the work measurement is undertaken by the staff with proper assignment of activity measurement where overlaps occur; monthly recording of work volumes; charges for information services will most likely cause the user to demand what he needs; and the cost benefit is calculated as the ratio of the value of "sales" to the cost of providing the activity. (AB)

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A COST BENEFIT TECHNIQUE FOR R & D BASED INFORMATION

B.T. STERN*

Apologia

The purpose of this paper is to invite criticism of the technique described. The text will be sent to critics with different interests. If I appear to describe what for you is already accepted practice or to give scant treatment to topics which in your opinion merit fuller discussion it is so that the reader is not discouraged by a heavy document.

Introduction

In an ideal world a person asking a question would have an answer immediately he realized the question existed. This ideal is unlikely to be achieved in the near future but it is possible now to obtain answers very quickly, The sum total of human knowledge is increasing exponentially and very large stores of information are involved. Mechanized retrieval is essential for all but the most specialized information collections - that is to say specialized either by narrowness of subject coverage or by some deliberate exclusion of for example all material not written in English.

Information staff will become involved increasingly with providing the system leaving its operation to the enquirer. As the enquirer will not always have the advice of the information scientist as to the best way to operate the system, a "feedback" mechanism is desirable. Such feedback might inform the user how many items are retrievable from the store using the indexing terms the user has selected so affording an opportunity to widen or narrow the search strategy. This type of system, using a "conversational mode", is already operated for several large computerized stores of information. One of these, the National Aeronautic and Space Administration system (N.A.S.A.) was developed by Lockheed in California at a cost of $\$5 \times 10^6$ and is shared with the European Space Research Organization (E.S.R.O.). Such development costs are probably too high for any single organization to justify and non-exclusive access to information stores will become more frequent to the extent that individual organizations will restrict themselves to indexing only their own reports[1].

The era is rapidly passing in which management accepted as a matter of faith that some form of information service was needed, particularly in research-based industry. The information explosion is giving way to a situation in which the limiting factors are the speed with which relevant information is retrieved and the number of facts or concepts an individual can usefully absorb

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Is the probability that new concepts are presented to the information recipient at the most appropriate moment high enough to give a reasonable justification to the cost of the system or do we need a fundamental reappraisal of the contribution the information scientist makes? Managers plan research in terms of expenditure and return. As the information staff also need to plan their activities over a period of years it is appropriate that they too should count the cost and measure the return they provide. The most commonly applied yardstick is the cost of the technical information service (including libraries but excluding market research) expressed as a percentage of the R & D budget (including salaries and overheads but not market surveys). Collinson[2], for

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example, recommends 3-5%. In a survey of twenty-three European Companies in the chemical industry the author found that the information services (including library services) accounted for 2-4% of the R & D budgets. This level was apparent irrespective of whether the Company was engaged in fundamental or applied research or whether the information service was mature or involved in the expensive establishment phase. This measure is too crude and in common with other factors such as the desirable ratio of information staff to the number of people they serve can be really useful only when obtaining a picture of services on a whole-industry or a national scale where the variability of the organizations included requires a broad treatment.

Cost Effectiveness and Cost Benefit

In recent years attempts have been made to focus attention on the costs of information services and the terms "cost effectiveness" and "cost benefit" have been used somewhat indiscriminately. Cost effectiveness seeks to show that a given service is operating to meet its objectives at the minimum possible cost. It is concerned with the techniques used and the cost involved in handling the information, often producing a typical figure for a unit of activity (e.g. the average cost of producing an abstract, of scanning a journal, etc.). Such considerations do not attempt to answer the question 'what is the value of having the information?' This value represents the cost benefit and to produce it there will always be a calculation of the cost effectiveness measures.

A number of cost benefit studies have been reported recently but each considers individual aspects of information work rather than providing general techniques applicable to a series of activities. The most recent is by Wills and Christopher[3] who have studied the cost benefit of marketing information and relating that cost to the expected share of the particular market. Ideally the value of a potential market share would be available before particular research projects are initiated. Market research is, however, expensive and the results take a long time to obtain. The usefulness of market research as a foil to possible over-optimism by R & D workers is accepted and in practice a compromise is taken whereby if the R & D feasibility study requires less time than the market research then this is investigated as the initial step of the project. Frequently, then, the value of information to an R & D project can not be based on market values and some other technique is required.

Proposed Cost Benefit Technique

The proposed technique consists of five phases, the first three of which are the classical components of a cost effectiveness study. The addition of the last two translate the study to one of cost benefit. The five phases are (a) specify objectives of the service, (b) measurement of work flow, (c) work costing, (d) charge to users of the information service, (e) equating demand and cost. Each will be discussed below.

The technique bears similarities to certain aspects of Output Budgeting as practised by the U.S. Department for Defense and the U.K. Department for Education and Science[4]. In Output Budgeting objectives are identified but not in terms of the means by which these are achieved (e.g. health not cancer research). Activities are listed which contribute to these objectives followed by the resources or inputs that are used. Finally the resultant outputs are measured. Output Budgeting fosters a philosophy that enables programmes to be kept under constant review. It is particularly useful where it brings together the work of different parts of an organization having the same objectives. Care must be taken to ensure that outputs are final outputs and not intermediates (e.g. the overall cost of techniques for alerting workers to the literature rather than the cost of preparation of current awareness bulletins).

(a) Specify Objectives

Although many information workers feel they know why they are carrying out tasks this is all too often expressed as a local target which is divorced from the overall strategy of the Company. It may well be that managers have not been made aware of the needs of the information scientists to know such strategies. Other reasons why objectives are not identified with Company strategy are that the information worker inherited a situation from a predecessor and/or that the volume of work does not allow time to think objectively. Whatever the reasons, before any cost analysis is started the objectives must be identified in terms of Company strategy. Often an outsider can assess with sufficient objectivity those tasks better carried out by other methods. This outsider is ideally someone with a knowledge of information techniques but from another part of the organization, i.e. someone not routinely concerned with the individual activities in a particular environment.

(b) Work Measurement

Having identified the objectives to be studied each is analysed for the contributory activites. The need to identify what is to be measured may seem obvious but in practice some of the steps may be obscured by overlap with other activities. For example the provision of a current awareness service may involve the publication of an internal bulletin which is distributed to laboratory staff. The effort involved in the typing of the contents and the addressing of envelopes and the work load on the internal mail service for the delivery of the bulletins are both activities that need measuring. However, it is more difficult to consider the effort in purchasing the journals which are scanned for items to be included in the bulletin as the journals are part of the library stock available to readers. In this case some proportion of the journal purchase effort must be allocated to the current awareness service. This might be as low as 10% if the journal has a long half-life on the shelves but as much as 50% or more if the journal is purchased mainly for current awareness (such as many weekly journals).

Having identified the different activities the technique calls simply for a measurement of the volume of work handled over a suitable period (e.g. the number of abstracts prepared, reports indexed, etc.). The record keeping can be carried out by an observer but is better undertaken by the staff themselves. In order to maintain reasonable accuracy yet avoid the danger of maintaining such detailed records that the cost of data collection becomes a significantly expensive operation a simple record form should be used and its use carefully explained to all concerned. If the reasons for the study are made clear and any fears of 'they are checking up on me' are avoided the data will be more reliable. It is worth spending some time with staff explaining the technique as a whole to gain their enthusiastic cooperation. Equally important is the provision of regular reports back to the staff of volumes handled, arrears of work and details of overall performances.

From the records it is easy to calculate the average time taken for an activity. This unit time should be calculated from a sufficiently large number of records that minor fluctuations in the work output caused by fatigue, interruptions, etc. are absorbed in the average. Periodically the unit times should be recalculated as the comparison with earlier values can be indicative of gradual changes in the working environment not otherwise discernible. Unit times permit accurate prediction of work output with a varying number of staff and more accurate budgeting for future staff. If several members of staff are carrying out the same task and their output varies significantly this can be indicative of different standards. For example, one person's abstract may be more detailed than is necessary for the current awareness bulletin it appears in or more obscurely that a search in response to an enquiry is too detailed to be justified.

(c) Work Costing

This phase requires the assistance of the Company accountants as each organization will have variations in its approach to the way in which service departments are costed. Some will carry the total cost as an overhead which is spread among the research ("production") departments according to their size (perhaps calculated by number of staff, by the space they occupy or as a proportion of their own budget). Whatever internal methods are used the volumes and unit times of phase b are translated into real (as opposed to notional) cash values.

To avoid unnecessary clerical activities the total volume of work for the particular activity should be recorded each month. From the unit times already obtained this factor can be converted into the proportion of the person's time who is concerned with the activity. This proportion may be less than or more than 100% but it is simpler to calculate the factor assuming the job is carried out on a full-time basis rather than apportioning costs to the time actually spent. This calculation should be repeated on a moving annual basis (January - December, February - January, March - February, etc.) to smooth out seasonal fluctuations and obtain a more consistent figure. Finally the cost to the organization of salary and added overheads is divided by the annual totals of time spent for the activity to give the cost in cash terms.

(d) Charge to Users of Information Services

It is desirable to bridge the gap between passively offering a service on a 'take it or leave it' basis and providing a service which accurately meets the need of the information user. If a user is asked to pay for what he receives he is more likely to demand what he needs. The information service will also have a greater sense of contributing to the corporate activity if what it provides is actively used. Not all information services can be charged in this way; for example the cost of providing and maintaining a general index will be an internal overhead of the service. Nevertheless from the 'sales figures' the information service will have a useful measure of the suitability of that particular activity which can be made to have greater 'sales appeal' and the worth of the information activities can be demonstrated to managers.

(e) Equating Demand and Cost

The cost benefit of the total information service can be assessed as a ratio of the value of total customer 'sales' to the total cost of the information service (including the information service overheads such as the cost of maintaining a general index and appropriate fractions of Company overheads such as rent, heating, etc.). Similarly the cost benefit of a particular information activity can be calculated as a ratio of the value of 'sales' to the cost of providing the activity (again including appropriate overheads contributing in this case to the particular activity).

Future Application of the Technique

Phases (b) - (d) have been tested for validity on a limited scale for different activities although as yet no single activity has had all the phases applied. Phase (e) was not applied as it is of significance only after the activities have beenmeasured in a full-scale operation. The whole technique will be applied to different activities within one of the information centres of Wellcome Group of Companies to further test its validity. Refinements of the technique will probably be needed and it is expected ultimately to apply the technique to the other information centres. It is thought

that the technique will assist in budget forecasting and can provide a useful tool to help resolve such problems as the allocation of resources to deal with the percentages of published and internal unpublished literature relevant to particular Company interests and to the phased development of computer-based selective dissemination of information with the resultant increase in the number of loans from external libraries.

A widespread adoption of this or a similar technique would provide information services generally with much needed data on costs and would enable assessment of cost benefit down to the level of fine detail required for consideration of the individual steps in the various activities. Comment on the proposed technique will be welcome.

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20th September, 1971

Dr. E. Bromberg,
Director of Libraries,
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U.S.A.

Dear Dr. Bromberg,

Your preface in the ERIC/CLIS bibliography on "Economics of Information" prompts me to send the enclosed copy of an unpublished Company report written in August 1970 and entitled "A cost benefit technique for R & D based information". At the end you will see it reports that future studies will take place but as yet these have been slow to implement. The intention to do so however remains.

Sincerely,

B.T. STERN,
Head, Research Information (Group)

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